ISSN 1683-9730

August 2005

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Newsletter of the Water Research Commission

In this Edition



At Grass Roots

When Dr Terry Everson decided to pay back her teaching loan to carve a career path in research, it paid huge dividends for this 50-something lady. True to her African roots, Terry's main focus is on empowering rural communities to manage their water and land resources so as to achieve sustainability.

Terry was born in Zimbabwe and she had the fortune of living in Zambia, Lesotho, Botswana and finally South Africa. She completed a BSc Hons and Higher Education Diploma at the then University of Natal. She then completed her MSc (Botany) in 1979, based on nutritional studies of an aquatic macrophyte in the Pongola flood plains. In 1995, at the robust age of 40 and with two young children, Terry attained her Ph.D (Botany).

In 1979 she got married and moved to the Cathedral Peak Forestry Research Station where she was employed by the SA Forestry Research Institute (1980-1989) as a grassland ecologist and later by the CSIR in their land-use and hydrology programme (1990 – 1996). "Here my research focused on assisting the neighbouring communities in the Upper Thukela catchment region to manage their natural resources. This included rehabilitation of eroded areas, grazing management and community-based catchment management. When the Cathedral Peak research centre closed down in 1996 I joined the University of KwaZulu-Natal where I am currently a senior lecturer in the Grassland Science discipline."

Dr Everson's association with the WRC began when she worked with her husband, Dr Colin Everson, on a WRC-funded project on the implementation and hydrology of agroforestry systems for fodder production in communal areas. "The WRC has a broad vision of catchment management and sees the importance of linking grazing management with water resources. Through WRC funding and support I have been able to develop a community-based monitoring programme of rehabilitation techniques on the hydrology of degraded catchments. Hopefully, this will link with the Maloti Drakensberg initiative of Payment for Environmental Services to create an income generation opportunity for the communities I work with. Through funding and bringing together different research and community organizations the WRC has played a pivotal role in community-based catchment management," says Terry.

Terry has published eight refereed scientific papers, four book chapters and several reports on vegetation, fire and rural resource management of montane grasslands.

Dr Everson's husband, Colin, and her family have been extremely supportive. Terry, however, admits that it was the influence of Prof Charles Breen (*Amanzi,* April 2004) that placed her on such a course. Prof Breen's influence began during her undergraduate years. She found his ecology lectures so profoundly stimulating that she changed her major subject from Zoology to Botany. "In my Honours year he was a hard task master and expected us to work round the clock. In spite of the Honours degree being the most arduous year of my career, it was also the one of the best years of my life. Somehow Charles managed to make work fun! After my Honours degree Charles persuaded me to stay on for Masters and that was the beginning of my research career," quips Terry.

Terry cherishes the dream that "Payment for Environmental Services" is eventually implemented in the Drakensburg so that the communities can use their data to justify payment from downstream water and land users who benefit from these efforts, thus generating an income from the volunteer work undertaken by such communities. Terry is passionate about her work and she places the interests of the rural communities high up on her list of priorities. She says,"Don't under-estimate the capacity of rural communities to understand and implement scientific concepts."

When Dr Everson is not engaged with research activities, she enjoys marathon running, swimming and canoeing. She has completed her ninth Comrades Marathon, and this year marked her first attempt at the gruelling Duzi Canoe Marathon. She has also completed eight Midmar Miles. These feats are more admirable when one understands that Terry is a Type 1 (insulin-dependent) diabetic.

Dr Heather Mackay, Research Manager at the WRC and head of Cross-Cutting Domain, Water and the Environment, says, "For me, Terry personifies the concept of 'action research'". Her continued commitment to the communities with whom she works has benefited not only our catchment management science, but also the community members themselves who have been involved with her. This is a great example of balancing the more objective, detached scientific mode of work, with real passion and caring for the people who live in the study area."

Terry, the WRC appreciates your work and how it impacts on improving the lives of South Africans, especially those from impoverished rural backgrounds.

Another Winner for WIN!

Mmule Majola commenced her career at Investcard in 1998 and then moved to the United States Peace Corps in 1999. In January 2000 she worked for the Civil Aviation Authority for a short stint of three months until she joined DWAF in April 2000. Thereafter, she worked for the Swiss embassy until the WRC snapped her up as a WIN administrator for a period of twelve months.

She already feels at home at the WRC. She says, "The WRC is doing a great job in providing information that is critical for a sustainable South Africa. The WRC plays a decisive role in promoting South Africa's economic growth and providing the means to a better quality life for all. My welcome at WRC was so great, I felt like I've worked here for days. Thank you to all who have made this transition a smooth one."

Mmule has her hands full with her seven-year-old son, Bongani, and her six-month-old daughter, Mbali. Mmule, the WRC welcomes you and we hope that your stay will be a pleasant one.

South African National Precipitation Research and Rainfall Enhancement Programme receives UAE International Prize for Weather Modification

Cloud seeding in progress

A joint project involving the Department of Water Affairs and Forestry, the Water Research Commission and the South African Weather Service has received international recognition. The South African National Precipitation Research and Rainfall Enhancement programme has been awarded the UAE International Prize for Weather Modification by the World Meteorological Organization. The award includes a financial contribution of US$ 200 000, to be used for further research.

The UAE Prize aims to recognize and stimulate significant advances, definitive studies and new ideas in the field of weather modification. The South African project involved the design and execution of a successful weather modification experiment that is considered to be a world showpiece because of its technological innovations and advances as well as its successful conclusions in the area of rain enhancement.

This international recognition is seen as a boost to the South African water sector, once again demonstrating that with minimal resources, South Africa is capable of world-class innovation in the scientific field. From a water resources perspective, the research gives South Africa the opportunity of enhancing rainfall which could increase river runoff by up to 25% in certain specific circumstances.

For more information on the UAE prize visit www.uaewxmodprize.ae or view the press release on the WRC website www.wrc.org.za

New Board for the WRC

The Minister of Water Affairs & Forestry has appointed a new Board for the WRC. The Board will serve the WRC from June 2005 to June 2008. The new members are:

Dr SJ Khoza (Chairperson) – Development Bank of Southern Africa

Prof FAO Otieno (Vice-Chairperson) – Tshwane University of Technology

Mrs MM Matsabu – DYNACON (Pty) Ltd

Dr DJ Merrey – IWMI (International Water Management Institute), Africa Regional Office

Mr MG Rall – Mvula Trust

Prof J Adams – Nelson Mandela Metropolitan University

Mr M Sirenya – Amatola Water

Ms VGN Mkaza – Agency for Community Education Training and Empowerment (ACETE)

Prof EM Stack – Rhodes University

Mr David Richard Holden – Department of Science & Technology

Dr R Kfir (*ex officio*) – Water Research Commission

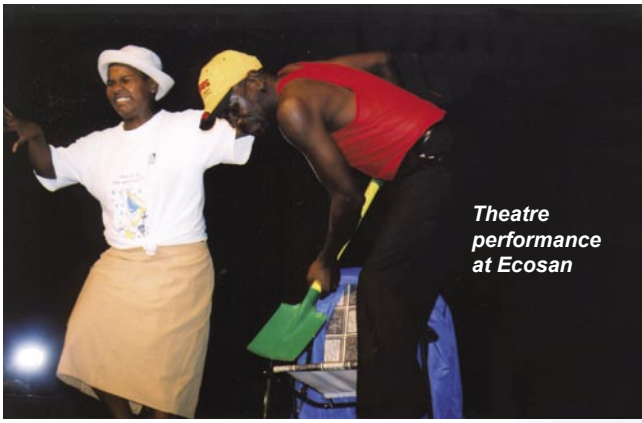
Mr Mike Muller (*ex officio*) – DWAF

You can view their profiles on the WRC website www.wrc.org.za

The WRC @ the EcoSan Conference

On 23-26 May the 3rd International EcoSan Conference was held at the ICC, Durban. The conference attracted delegates from many countries. One of the highlights of the conference was a theatre performance organized by Durban Metro Water Services. The WRC exhibited at this event and many orders for WRC reports were received. The WRC was a key role player at the conference. As part of its capacity-building drive, the WRC sponsored the conference registration fees for 20 students.

***Left**: Some of the students that the WRC sponsored*



Theatre performance at Ecosan

What's New

Report No 927/1/04 (Contractor: Umgeni Water)
Occurrence and source of *Cryptosporidium* and *Giardia* in catchment areas and wastewater works

The enteric protozoa *Cryptosporidium parvum* and *Giardia lamblia* have been recognised as important causes of both outbreak-related and sporadic diarrhoea in humans. Pilot studies have shown that large quantities of the parasites were present on occasions in some sewage effluents. Using untreated surface water as a source of drinking water exposes a great number of the South African population to higher numbers of these pathogens and increases the risk of infection. The study consisted of two parts: firstly, the use of PCR-based methods for the confirmation of results and evaluation of it's compatibility with the commonly used concentration, purification and detection methods were investigated. The second part investigated the incidence of these protozoa in the rivers in the Pietermaritzburg catchment area and the impact of the rural, peri-urban and urban settlements and whether the diarrhoea, suffered by patients in the area, was caused by *Cryptosporidium* and *Giardia.* The protozoa were detected sporadically and widely in the river and water samples and the conclusion is that they are probably ubiquitous in the study area. A risk assessment was done to provide a quantitative estimate of the probability of illness associated with environmental exposures and focused on human health risk assessment from *Giardia* cysts and *Crytosporidium* oocysts present in the river water. The sources of contamination were identified and some preliminary guidelines were drawn up for the community, veterinarians and for safeguarding potable water supplies, but the implementation of this is the responsibility of the relevant authorities

Report No 749/1/04 (Contractor: University of KwaZulu-Natal)
Modelling as a tool in integrated water resources management

One of the objectives of WRC-funded programmes on water resources is that the benefits of the technologies generated should feed back to the public and should contribute to the formation of catchment-related policy. This project enshrined this objective and was advantaged by the fact that it took place over the period when the Water Act of 1998 was being formulated and progressed well after this Act was passed. In this regard this project investigated Integrated Catchment Management (ICM) approaches as they transformed with the Water Act. Findings from ICM investigations and specialist field work were used in making further improvements to the ACRU model and the supporting climatic and soils database. The redeveloped model was then applied to case studies to investigate several scenarios. This study led to the formulation of a follow-up study on the establishment of an installed hydrological modelling system for Catchment Management Agencies (K5/1155) which is now in its final stages.

Report No 1289/1/04 (Contractor: Johannesburg University)
Removal of fluoride from drinking water with clay-based defluoridators

In South Africa, there are regions where natural waters lack the required fluoride concentration. Similarly, there are regions in South Africa where the natural fluoride concentration in water exceeds the concentrations generally recognised to be acceptable to the health of the public. The research products of this contract were: a physical explanation of how fluoride adsorption onto baked clay works and a prototype of a domestic unit for the removal of fluoride from drinking water. The project outcomes were: The use of discarded brick fragments, as piloted in Sri Lanka, was viewed as a promising technology; The adsorption of fluoride onto clay was modelled successfully; A practical, simple method of compression and baking was developed which will effectively immobilise the clay as pellets to ensure good water quality; the initial defluoridation efficiency of domestic units using these pellets was measured at about 70%.

Report No 940/1/04 (Contractor: Anglo Coal)
Electrochemical treatment for the removal of sulphates from acid mine drainage

Coal mining operations in the Mpumalanga area generate large volumes of high-sulphate acid mine drainage (AMD) effluents which pose a threat to the aquatic environment. These effluents require treatment to acceptable quality standards. The objective of this project was to assess and demonstrate the technical and commercial potential of an electrochemical process for removing sulphate from AMD effluents and phosphate from sewage effluents. The research investigation was carried out using a newly-designed electrochemical (EC) reactor on site at Navigation Colliery (Anglo Coal). In the EC reactor (nominal 1 Mℓ/d capacity), zinc was used as a sacrificial anode to complex and precipitate sulphate from the effluent. The effluent was simultaneously neutralised and the base metals were precipitated, while reducing also organics and alkalinity. The results obtained showed that the effective hydraulic capacity of the plant was directly proportional to the level of contaminants in the effluent. More sulphate could be removed if less calcium and magnesium were present. A theoretical computer model describing the dynamic performance of the system from start to equilibrium was developed, and was found to simulate the experimental results very closely. A highly accurate response prediction could be made for the process for any known effluent with a known composition.

Report Nos 1217/1/04 & 1217/2/04 (Contractor: University of KwaZulu-Natal)
A flood nowcasting system for the eThekwini Metro
Vol 1: Umgeni nowcasting using radar-An integrated pilot study
Vol 2: Modelling flood inundation in the Mlazi River under uncertainty

This project aimed, firstly, to pull together, for flood forecasting in a real world application, the outcome of previous research funded by the WRC in the areas of radar estimation of rainfall, space-time modelling and forecasting of rainfall, linear catchment modelling and river-flow modelling, and, secondly, to provide decision- makers in Umgeni Water and Durban Metro with the tools to be proactive rather reactive in the context of flood warning. The forecasting of rainfields in real-time gives good forecasts up to an hour ahead over a large area; the improved estimation comes from the merging of information from raingauges and from radar. Validation of streamflow forecasts on "unseen" historical streamflow data (offline) was successfully accomplished, although testing in real-time (online) could not be completed because the real-time flow data did not become available until after completion of the project. As a result of the project, people living near rivers now have both the potential for receiving warnings about impending floods and the knowledge that the Disaster Management Group is working towards mitigating floods in their area in a proactive rather than a reactive way. Furthermore, with the new flood forecasting capability, 6 to 12 hour warning of an impending flood will enable industries to evacuate staff and perform controlled shut downs or take steps to reduce the damage to sensitive plants.

Report Nos 1151/1/04; 1152/1/04 & 1153/1/04 (Contractor: DEAT)
Spatial interpolation and mapping of rainfall (SIMAR)
Vol 1: Maintenance and upgrading of radar and raingauge infrastructure
Vol 2: Radar and satellite products
Vol 3: Data merging for rainfall map production

Since conventional meteorological infrastructure is dwindling at an alarming rate in South Africa, it became necessary to investigate the complementary use of conventional and less conventional infrastructure in sourcing rainfall data and mapping daily rainfall for the country as a whole. The complementary sources considered in this component project are surface networks and remote sensing sources, namely radar and satellite. The focus has fallen on maintaining current systems as well as using new technologies and techniques to upgrade systems, where necessary, with a view to securing and sustaining a reliable data flow from the above-mentioned data sources. The raingauges of the Liebenbergsvlei and Durban networks played a vital role in the investigations of eliminating ground clutter and the ground validation of radar estimated rainfall. Improvements and upgrades were implemented at the majority of radars within the network, ensuring a reliable power supply to the systems. A remote control and monitoring system, whereby the functioning of individual radar systems could be monitored from a central point, have been implemented. This kind of information became available for the first time, allowing objective evaluation of the reliability of individual radar systems within the NWRN. Close cooperation with the SAWS database developers led to the inclusion of real-time data which will be considered for archiving purposes. This component project of SIMAR managed to promote data cooperation and sharing between institutions, albeit on a very small scale, and limited to the operational exchange of data. The training of personnel in the maintenance and upgrading of observational systems received high priority in this project.

CRECHE Centre for Research in Environmental, Coastal and Hydrological Engineering and School of Civil Engineering, Surveying and Construction; University of KwaZulu-Natal Howard College Campus – Durban

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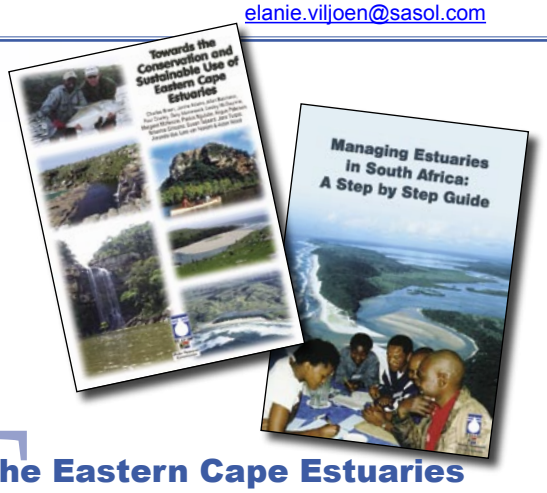

The Eastern Cape Estuaries Management Programme (ECEMP)

The research team of the ECEMP recently completed the first phase of a research programme aimed at supporting improved management of Eastern Cape estuaries. Two reports have been published by the WRC: a comprehensive technical document, *Towards the Conservation and Sustainable Use of Eastern Cape Estuaries* (Report No TT 237/04), and a shorter user-friendly guide, *Managing Estuaries in South Africa: A Step-by-Step Guide* (Report No TT 243/04). These reports can be ordered from the WRC at orders@wrc.org.za; Tel: 012- 330 9015. For more information on the ECEMP programme contact Fonda Lewis at 033- 346 0796 or e-mail: lewis@ukzn.ac.za

The SABC Career Faire

The SABC Career Faire was held in Cape Town on 24-26 May and in Polokwane on 31 May - 2 June. Agnes Molubi (Group Assistant: KSA 2) represented the WRC in Cape Town and Bennie Mokgonyana (Co-Ordinator: KSA 3) facilitated the Polokwane event, together with representatives from DWAF. They distributed career guides and explained the structure of the guide to learners and educators who visited the exhibition stand.

***Top left**: Agnes Molubi assists learners at the SABC Career Faire in Cape Town*

***Top Right:** Learners at the SABC Career Faire in Cape Town*

***Bottom left:** Visitors at the WRC-DWAF stand in Limpopo Province (Polokwane)*

***Bottom right:** The many learners at the SABC event in Limpopo Province*